



THE NEW ZEALAND  
INSTITUTE OF FOOD SCIENCE  
& TECHNOLOGY INC



MINISTRY OF BUSINESS,  
INNOVATION & EMPLOYMENT  
HĪKINA WHAKATUTUKI

# NZIFST Conference 2018

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# SPEAKER ABSTRACTS

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IN FOOD WE TRUST



Confidence Built  
on Science  
and Technology

**Distinction Hotel, Te Rapa, Hamilton**  
**3 - 5 July 2018**  
**[www.nzifst.org.nz](http://www.nzifst.org.nz)**

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## DAY 1 - Tuesday 4 July

### **A1-1 Consumer behaviour and the emergence of food scares in China**

Eddy Fang (Xi'an Jiaotong - Liverpool University)

As China is continuing on its path of fast development, an important challenge resides in the improvement of food safety. Despite good progress in the past years in terms of supply chain safety standards and enforcement, consumers' perception of domestically produced food products remains characterized by low trust towards suppliers and producers. This contributes not only to the increase of imports of foreign products to the country, but also to the wave of mergers and acquisitions currently observed in industries related to food supply.

This talk will present a stream of research we are currently conducting around the topic of consumer trust and food safety in China. In this context, three main research directions will be discussed: (i) constructing trust in local products, (ii) importing 'trusted' products from overseas, and (iii) going beyond the question of trust in the Chinese market.

### **A1-2 Trust me - I'm from the Government, I'm here to help.**

Glen Neal (FSANZ)

Do consumers trust food? Do science and technology contribute to confidence in food or do they undermine it? The growth of the clean label movement suggests something other than science and technology builds confidence in consumers.

The good news is that government is here to help. Consumer protection and commercial certainty are key deliverables in a food system that is increasingly globalised, subject to the emergence of new (and re-emergence of the not-so new) hazards and prone to contrasting expectations of absolute safety by the consumer on one hand, and the rights of the food sector to freely innovate, on the other. However, the tide of trust in institutions such as government has been going out for some time. Will a tsunami of disruptive revolt ever arrive? What might it look like or are the waves already lapping at our collective doorsteps?

### **B1-1 The core genome and beyond: comparative bacterial pathogenomics and functional gene analysis in foodborne pathogens.**

Patrick Biggs, Massey University

Campylobacter jejuni is the most common cause of foodborne bacterial diarrhoeal disease in the world, with clinical infection outcomes ranging from asymptomatic infection to life threatening invasive disease. In this study we compared the genomes of 10 invasive (blood and joint aspirate) NZ C. jejuni isolates with those from a UK gastrointestinal dataset in order to assess whether there are invasive strain-specific patterns in the accumulation of mutations in protein coding genes. Whilst there were no differences in gene content or distribution, we identified through a profile hidden Markov model technique a collection of genes that display sequence divergence patterns associated with invasive infection, including some that have been previously linked to C. jejuni virulence and invasiveness. This study presents a screen for functional sequence variation associated with a phenotype of interest that can be applied more broadly to improve our understanding of the genomic changes that occur when bacteria transition to a new niche.

## **B1-2 Molecular microbiological solutions to current issues versus chasing ghosts of outbreaks past.**

Helen Withers (MPI)

Whole Genome Sequencing (WGS) and its use in subtyping is one of the fastest growing tools in the modern microbiology laboratory toolbox for researchers and regulators alike. Both use the same tools but the outcomes can be significantly different. As the costs decrease and the technology becomes more readily available, the routine use of WGS for sub-typing of foodborne pathogens for food safety and outbreak management will continue to increase. However, the analysis is only as good as the database on which it is made. There is a clear need for a robust and extensive database to support conclusions. Do we chase the ghosts of pathogens past or focus on the current and future antagonists to populate the database? The question is where does the real benefit of these new and increasingly sensitive methods lie; can we afford to get it wrong..... after all, we all still need to eat!

## **B1-3 Sheep milk is a great nutritional product. What about microbiological risks?**

Tanya Soboleva (MPI)

Sheep dairy is a fast growing industry in New Zealand. Currently there three firms that together have over 17,000 dairy sheep, supplying dairy products for high end consumers primarily in Asia. Smaller firms (50-500 sheep) produce mostly sheep milk cheese and yoghurt for domestic consumption.

The nutritional value of sheep milk is greater than that of goat and cow milks, with higher levels of proteins, lipids, minerals, and vitamins essential to human health. However, if not processed optimally, the risk to human health may be greater than for cow's milk.

Different sources of udder contamination result in different types and prevalences of pathogenic bacteria in bovine cf. ovine milks. Pasteurisation parameters that inactivate pathogens in cow's milk may, because of differences in composition, be insufficient for sheep's milk.

This talk investigates differences between sheep and cow milk that might affect their safety.

## **B1-4 FoodSafe: Real time bacterial enumeration and detection using spectroscopic fluorescence method.**

Frederique Vansholsbeeck (University of Auckland)

Food safety is critical to New Zealand's global reputation as a food producer. Current cost effective methods for detecting bacteria in food require a laboratory and take days to get results. Using laser, photonics technologies and microfluidic, we are developing new techniques to test for bacteria in any fluid. Our invention can give a result in 20 minutes, not 3 days – no lab needed. In the future, when it is used by the NZ meat industry, it will save many millions of dollars each year. The potential benefits of our research include reducing the cost of wastage to food producers, improving food safety, and extending the shelf-life of perishable food products such as fish and dairy by several days. During the talk, I will present some of the latest results obtained by the FoodSafe team.

## **B2-1 Shining a torch down the rabbit hole – why trust is important in a supply chain!**

Kiri McComb (University of Otago)

Supply chains can vary from short and simple to long and complex. For consumers at the end of the supply chain, they want surety of the quality, safety and authenticity of the product they receive. For most producers at the start of the supply chain, they want surety that the product they have put their effort into creating is representing their brand in the best way at shelf. What happens along the way can sometimes be unknown. We trust those parts in the middle of the supply chain to move product from start to finish without incident or change. Unfortunately many events over the past decade have shown we need to be wary of investing that trust. A single negative event within the supply chain can have a major effect on the trust in a brand. What can we do to gain that trust back?

## **B2-2 Are you feeling lucky?**

Peter Stevens (GS1)

As our understanding of food evolves, we are seeing the impact of intergenerational change and a host of global revolutions; these are driving us more towards attributes within our production systems and food integrity stories. New Zealand needs to evolve its understanding of these global trends in order to stay relevant and profitable. We need to stay a step ahead of alternative protein and other innovations and present our point of difference with conviction on the world stage.

## **B2-3 Food – the Evolving Paradigm**

Tony Egan (Greenlea)

As our understanding of food evolves, we are seeing the impact of intergenerational change and a host of global revolutions; these are driving us more towards attributes within our production systems and food integrity stories. New Zealand needs to evolve its understanding of these global trends in order to stay relevant and profitable. We need to stay a step ahead of alternative protein and other innovations and present our point of difference with conviction on the world stage.

## **B2-4 Authenticity of Manuka Honey**

Terry Braggins (Analytica)

Manuka honey is the most recognised and valuable honey traded, earning New Zealand \$270M+ per annum. Honey is the third most adulterated food (after olive oil and milk) in the world, and Manuka has not been exempt. This talk will cover the types of adulteration that have been tried, some intentional and others unwittingly, and what strategies are used to assure the authenticity of honey.

## **B3-1 Are consumers health literate when they read the pack? Dumbing down the pack design doesn't help.**

Duncan Stuart (Kudos Dynamics)

Using marketing and pack descriptions to communicate health standards is not so easy. Consumers bring to the party various impressions of health – sometimes accurate, sometimes deeply founded on poor information. How much should the food industry communicate to the buying public. There's evidence to suggest that more precision is required and that efforts to simplify the story with health ticks and badges of honour is merely adding to confusion.

### **B3-2 Dietitians' perspectives: Do consumers really understand nutritional claims or not?**

Angela Berrill (ABC Nutrition)

“Natural”, “sugar-free”, “no added sugar” - while these claims are all nutrition buzzwords at the moment, do consumers really understand what these claims mean? Are nutritional claims merely ‘marketing-hype’ or do they help consumers determine which product is a healthier choice, amongst all the nutrition noise on the supermarket shelf?

### **B3-3 Nutrition messages gone wrong and how to avoid the fall-out**

**Katrina Pace (Dietitian)**

Even the simplest nutrition message can go horribly wrong when placed in the hands of social media, influencers and bloggers. With increasing awareness of how pseudo-science can twist nutrition messages we'll explore characteristics of who is more prone to being influenced by nutrition messages, taking them to extremes; the motivation behind those who pick up simple nutrition messages and take them to a whole new levels; and how to avoid the fall-out if you're nutrition message or product is hijacked.

### **B3-4 Health Star Ratings – Giving consumers greater confidence in nutrition labelling**

**Rebecca Doonan (MPI)**

The Health Star Rating ([www.mpi.govt.nz/healthstars](http://www.mpi.govt.nz/healthstars)) “provides convenient, relevant and readily understood nutrition information and guidance on food packs to assist consumers to make informed food purchases and healthier eating choices”. The government led, voluntary system for packaged foods has been available for four years and appears on close to 4000 products. A progress review of the system at two years was undertaken and a full review at five years is being carried out to determine whether the system is meeting its objectives and is performing well. This presentation will look at how to implement the system, tools available to help manufacturers, and most importantly how the system is tracking so far, what is being considered in the 5 year review and how the Health Star Rating can achieve its goal of providing simplified nutrition labelling in which consumers (and manufacturers) can have full confidence.

### **B4-1 Physicochemical properties of kiwifruit flour**

Dongxing Li (University of Auckland)

Kiwifruit contains abundant starch (~ 52%, dry weight basis) as the fruits are harvested commercially. The use of those starchy kiwifruits has not been explored so far. This work collected two kiwifruit varieties, green (Hayward) and gold (Gold3), around the time for their commercial harvest. The fruits were freeze dried and ground into flour. The physicochemical properties of the flour have been studied alongside with the traditional flours, maize, wheat and potato. Overall, the kiwifruit flour exhibits the similar behaviours with those traditional flours in the analysis of pasting, gel texture and dynamic oscillation whereas the values of that are significantly lower. In contrast, the antioxidant capacity and amount of free phenolic compounds of kiwifruit flowers are significantly higher than the traditional flours. Based on the physicochemical properties, the kiwifruit flour can be developed as an important ingredient in various food products to enhance the nutritional benefits.

#### **B4-2 Stabilisation of apple processing by-products**

Thomas Sowersby (Plant & Food Research)

Apple processing by-products (8,000 to 10,000 tonnes annually in New Zealand) are pressed for juice and the pomace sold as animal feed for low financial return. There is an opportunity to turn these by-products into value-added products; however, stabilisation is required to allow further processing. Our objective was to develop and evaluate stabilisation treatments for apple flesh and peel by-products generated from a cut-apple manufacturing line.

Enzymatic browning and microbial contamination were the key stability risks identified. A range of stabilisation treatments were screened at a laboratory-scale after two and four weeks of storage: ascorbic acid, blanching, citric acid, sodium chlorite and sodium metabisulfite combined with freeze drying, oven drying and chilled storage. Stabilisation options were evaluated for manufacturing suitability and against established marketing goals: appearance and fibre, polyphenol and triterpenoid content.

Blanching and sodium chlorite treatments were selected and paired with freeze drying, oven drying and chilled storage for pilot plant-scale trials, which were run to gather further process development information. These combinations of methods all showed promise for industrial application.

Blanching and sodium chlorite are both viable stabilisation options for short-term wet chilled storage. Both oven and freeze drying are the optimal methods for long-term control of microbial spoilage and enzymatic browning.

As a result, stabilised flesh was produced, with acceptable appearance and a total dietary fibre content between 38 and 51% (dry weight), with strong potential for the ingredient market, particularly for foods targeted for fibre fortification.

#### **B4-3 Active packaging utilising grape tannins from winery marc**

Paul Kilmartin (University of Auckland)

Simple extraction procedures using environmentally friendly solvents were used to extract tannins from grape marc. The tannins were purified with Amberlite FPX-66 resin and characterised by GPC and solid-state NMR. The tannins were incorporated into biodegradable ethyl cellulose films, which showed antioxidant activity and antimicrobial activity against Gram-positive and negative bacteria. There was no significant loss in antimicrobial activity of the tannin powders against *Staphylococcus aureus* or *Escherichia coli* after heating to 250 °C. The grape marc extract at 0.25 to 10% by weight was melt blended polyethylenes at 170 °C, and the antioxidant and antimicrobial activity of the films established. The modified films have potential for use in food packaging to extend product shelf-life. The depleted grape marc was assessed with seedling emergence tests, where the ability to support plant growth was established. The programme offers value-added strategies for better utilization of waste streams from the wine industry.

#### **B4-4 Microbial proteases from tannery materials**

TK Tantamacharik (University of Otago)

Innovative perspectives on utilization of keratin from food and agricultural industries using proteases harnessed from microorganisms in tannery conditioning bath liquors.

Microorganisms in harsh environments exposed to complex protein (keratin/collagen) materials may produce novel proteases to hydrolyze these proteins for utilization by the microorganism. Keratin containing wool, feather, hair, horn, and hoof natural products are by-products from meat processing industries

that present a considerable under-utilized resource. We have analyzed tannery conditioning bath liquor samples for isolation of protease-secreting microorganisms. Several microbial isolates have been obtained and typed based on 16S rRNA gene sequencing. Two isolates that are representatives of *Bacillus licheniformis* have been selected for preliminary study as their species has been approved by the FDA as safe for food and beverage applications. These microorganisms may secrete proteases with unique hydrolytic specificity and capability to hydrolyze complex protein substrates. Such proteases would have potential in the hydrolysis of complex protein assemblies for applications ranging from production of hydrogels to bioactive peptides and nutraceutical fortification of food products.

#### **C1-4 The New Zealand Total Diet Study – Providing 40 years of confidence in the food supply**

Andy Pearson (MPI)

The New Zealand Total Diet Study (NZTDS) is carried out every four years to determine the level of agricultural chemicals and contaminants in the New Zealand diet, and to evaluate any potential risks to consumer health. Similarly, a baseline of nutrient analytes is determined. This presentation details the findings of the 2016 NZTDS, examines trends over the last 40 years of total diet studies, describes baseline levels and risks of additional analytes added to the 2016 NZTDS and discusses the potential direction for the future of the NZTDS. The overall findings of the 2016 NZTDS provide good confidence that the New Zealand diet is safe and wholesome for the New Zealand consumer

#### **C1-2 Shellfish toxin monitoring and management improvements over the last 25 years**

Tim Harwood (Cawthron Institute)

Twenty-five years ago, our seafood industry faced a crisis, toxic algae were present in our growing waters and this resulted in a nationwide three-month harvest closure of our burgeoning shellfish aquaculture industry. The enforced closure and ban on shellfish exports was in response to a toxic algal bloom that was unknown to scientists at the time and posed a public health threat. This situation was clearly not ideal but the way in which industry, regulators and scientists responded to the event then, and the way in which this sentinel event was a catalyst for innovation, collaboration and the development of knowledge since, has resulted in New Zealand having world-leading harmful algae monitoring and management practices. The path has not always been smooth but we now have a system that works and underpins our billion-dollar, iconic seafood industry that is backed by a strong partnership between industry, science and regulators. We have a long-term record of monitoring around New Zealand so we know what to expect. In addition, advances in molecular tools and chemical methods ensure we can rapidly identify harmful algal species and any toxins that they produce. If this type of event happens tomorrow, we will know quickly and there won't be any mystery about it. In this presentation we will look back at key events over the past 25 years that have resulted in improved practices and highlight current research that ensures ongoing innovation and improvements to monitoring and management systems.

### **C1-3 Freezing and high pressure processing to control human pathogenic bacteria (*Vibrio vulnificus* and *Listeria monocytogenes*) in New Zealand shellfish**

Sravani Gupta (Plant & Food Research)

Food safety concerns are significant for shellfish producers and consumers. Oysters can become infected with *Vibrio vulnificus*, an opportunistic pathogen present in oyster-harvesting seawaters. Mussels can be infected by *Listeria monocytogenes*, either naturally present in seawater or from seafood processing plants. Food processing technologies such as freezing, high pressure processing (HPP), low temperature pasteurization and irradiation are postharvest intervention methods aimed at delivering safe food. Industry however, has limited choice from these techniques because of both cost restraints and customer demand for natural products. We tested blast freezing and frozen storage for oysters inoculated with *V. vulnificus* and HPP for mussels inoculated with *L. monocytogenes*. For *Vibrio*, oysters had an average bacterial reduction of 0.84 log<sub>10</sub>MPN from Day 0 to Day 1 as a result of blast freezing at -55°C. This increased to over 2 log<sub>10</sub>MPN within 3 days of frozen storage and usually achieved the target reduction of 3.52 log reduction within 90 days at -18°C. However, 90 days is a long time for an industry that usually sells frozen shellfish over a much shorter time frame. Comparing this with a pressure-temperature-time kill, HPP achieved more than the target 5 log<sub>10</sub>MPN reduction in *L. monocytogenes* when mussels were processed at 500 MPa at 20°C for 3 min. However, as there were changes in appearance, texture and chilled shelf life, industry would need to manage market expectations. We conclude that emerging processing technologies could provide possible alternatives to conventional methods.

### **C1-4 Key successes of the NZ Allergen Bureau**

Debbie Hawkes (Allergen Bureau)

The ever increasing incidence of food allergens is an international phenomena, creating more need from allergen sensitive consumers to be able to make informed choices based on clear food labels.

The Allergen Bureau is the peak industry body representing food industry allergen management in Australia and New Zealand. A free helpline, website, and monthly eNews provide technical support. The VITAL (Voluntary Incidental Trace Allergen Labelling) program provides a systematic scientifically based, allergen risk assessment process. This is routinely reviewed by the VITAL Scientific Expert Panel, which is made up of recognised global food allergen experts.

Ongoing activities :

- Risk Review - Interactive website guiding users through best practise steps
- Certification - Auditable scheme under ISO 17065
- Webinar series -in progress with support of AusIndustry
- Coordinating FAMS 2019 conference
- Review and update of Food Industry Guide to VITAL Program

Submissions on Allergen related FSANZ proposals.

e.g. P1044 – Plain English Allergen Labelling

### **C2-1 Utilisation of Insect based proteins in food system in future – A study on functionality and possible applications.**

Varun Gadodia (Massey University)

Need of a sustainable alternative of protein to fulfil the projected rising demand of food proteins is well known. Insects seem to be a promising alternative, but in order

to welcome them in human food chain, scientific information related to their functionality, physiochemical properties and application needs to be established to address the potential benefits and challenges associate with insects and insect-based ingredients. We have attempted to characterise commercially available cricket powder that is high in crude protein for various physiochemical properties and incorporate them with a plant based protein formulation to obtain structured analogues that resemble conventional meat by a high temperature and pressure cooking process. Our objective here is to understand role of insect proteins in structure formation and bonding and establish scientific basis for future applications. Further in this study we intend to include digestibility studies and nutritional comparison with other dietary sources of proteins.

## **C2-2 100% plant product and Plant and Food Collaboration**

Sarah Kennedy (Life Stream)

Taking NZ Science to the world

A new supplement that curbs calorie intake (CaloCurb™) has been developed in New Zealand and has launched in the US, the world's largest market for weight management. Cal-Curb™ contains Amarasate™ extract, which is the lead ingredient from an MBIE research programme for 'Foods for Appetite Control', and is a New Zealand grown extract that suppresses appetite and reduces daily calorie intake. Targeting the Bitter Brake™ mechanism, the bitter extract is released in the duodenum and triggers taste sensors in the gut to release satiety peptides. Amarasate™ extract was clinically tested and showed a reduction in calorie intake of 20%. Industry consultants as well as a team of MBA students from the UCLA Anderson School of Management were engaged to confirm the business model and market entry strategy for the US. The technology was licensed to Lifestream International, a New Zealand private equity owned company who has financed the product launch direct to consumers in the US, bypassing historical retailers, maintaining margin for the commercial partner and developing direct consumer relationships through an online only initial launch. The product was launching in New Zealand in April 2018 and US May 2018.

## **C2-3 NZ Hemp Industry -breaking into the Hemp Seed Foods Market**

Richard Barge (NZHIA)

We had many hemp foods in the nineties, then we joined FSANZ in 2000 and it all stopped. We had to fight to keep hemp seed oil available and after 18 years of lobbying in Australia and NZ we are about to regain access to hemp seed foods. Richard will be discussing what this means for the hemp industry, the nutritional qualities of hemp seed and how New Zealand can take advantage of a new raw ingredient for use in a wide range of products that can move plant based foods in to the mainstream.

## **C2-4 What ever happened to Single Cell Protein**

John Brooks microTech Services

The concept of eating non-animal or non-plant proteins is not new. Germany used yeast protein to supplement the diet of the population during both world wars. During the 1960s, interest in single cell protein really took off, based on groundbreaking research and development by scientists and a few large companies. It is likely that motivation was a mixture of "Feed the world" and "Let's develop a process that will make huge profits for the company". By the 1980s very large sums of money had been invested in R&D and the building of production plants. The CIA

became very interested in the capabilities of the Soviets to use SCP to replace grain in animal production. Now we hear very little about SCP, though alternative proteins are still of interest and have a session devoted to them at this conference. The media seize upon reports of “lab-grown meat and non-dairy milk”. Do the reporters understand the production of non-animal and non-plant proteins? In this paper, I will briefly trace the history of SCP from both literature searching and personal experience, and survey the current and possible future state of SCP production.

### **C3-1 It's not all about the food**

Kate Berridge (Beyond Obesity)

Through the experience of working with and studying obesity, Kate has come to understand there is considerably more complexity to weight gain, weight loss and weight maintenance than is generally assumed. Because of this, Kate is passionate about reframing the way obesity is viewed in our current obesogenic environment. In our desire to create solutions for perceived problems we often become polarized in our thinking. In her day-to-day practice working with her clients, Kate sees this in relation to food. However, it frequently transpires that the use of food is a symptom to an unrelated cause.

Creating dialogue associated with acknowledging the complexity of how we maintain our weight and developing an awareness that it is simply not all about the food seems a great place to start.

### **C3-2 Hard to swallow?**

IDDSI overview – Anna Miles (University of Auckland)

New Zealand Implementation of International Dysphagia Diet Standardisation Initiative: Health Boards, Food Service and Food Industry

International Dysphagia Diet Standardisation Initiative (IDDSI) provides internationally accepted terminology and definitions for texture-modified food and drinks for individuals with dysphagia (swallowing difficulties) of all ages. The IDDSI group encourages international use of the standardised labels, colour and number codes. Consistent and distinguishable terminology promotes consistent and accurate use of texture modification leading to improved patient safety.

IDDSI provides diet and drink level descriptors that can be used by food services, food industry, school and hospital kitchens, as well as healthcare professions and the community.

In 2017, Dietitians New Zealand and New Zealand Speech-language Therapists' Association committed to a successful implementation of the IDDSI standards across all sectors in New Zealand by the end of 2018. They have been working with industry, service providers and healthcare professionals to educate, enable and support adoption of the Framework. This presentation will inform the audience about the standards and describe some of the successes and challenges we have faced working with the food manufacturing industry and food service providers.

### **C3-3 Satiety supplement research**

Edward Walker (Plant & Food Research)

Preclinical to clinical: the development of the Amarasate® extract.

The control of appetite is critical for successful weight management in obesity. Amarasate extract is a plant-based dietary supplement developed to activate gastrointestinal bitter taste receptors (Tas2Rs) that trigger the release of appetite suppressing hormones in a mechanism we term the “Bitter Brake”.

The Amarasate extract was identified by in vitro screening using a Tas2R expressing human cell-line. Gut biopsies collected from volunteers (n=33) undergoing routine gastroscopy or colonoscopy confirmed the presence of human Tas2Rs in the gut. Clinical efficacy of the extract was assessed using healthy male volunteers (n=20) in a randomised, double-blind, cross-over study that showed a 18% reduction in energy intake and significant stimulation of appetite suppressing gut hormones (GLP-1, CCK and PYY).

By utilising a mechanistic approach combining both preclinical and clinical methodologies we have been able to successfully develop and characterise a dietary supplement targeting the regulation of appetite.

### **C3-4 Waikato Energise Project**

Leanne Young (AUT)

Under 5 Energize: Improving child nutrition, physical activity and dental health through early childhood centres

Despite increasing early childhood education participation rates, very little is known about how evidence-based nutrition and physical activity interventions can be translated into early childhood centre (ECC) environments. Based on the successful and ongoing (since 2004) Waikato-wide primary school Energize programme, Under 5 Energize (U5E) has been delivered to 120 early childhood centres by Sport Waikato. Under 5 Energize (funded by the Ministry of Health) reached 93% of centres targeted. The programme reaches 30% of 4 year olds of whom 31% are Māori and 53% live deprivation quintiles 4 and 5. From 2013 to 2017 deprivation for children increased more for Energized children than non-Energized. Despite this increase in deprivation between 2015 and 2017 environments within U5E ECCs improved and for Energized Māori children compared to non-Energize children overweight did not change and there was a small reduction in visible dental decay.

### **C4-1 Application of New Zealand linseed in Asian staple foods**

Fan Zhu (University of Auckland)

Chinese steamed bread (CSB) is a staple food in Asia. It has high glycaemic index. Linseed, as a source of abundant dietary fibre and phenolic compounds, was used to fortify CSBs. Different proportions of ground linseed were added into CSBs, including 2.5%, 5%, 10%, 15% and 20% of substitutions. The results showed that the linseed content in flour mixtures was negatively correlated with the pasting properties (pasting temperature, peak viscosity, final viscosity and other relative parameters), gel texture after pasting and storage and loss modulus. With increasing ground linseed content, the hardness and other textural properties of linseed CSBs were raised. Furthermore, the linseeds enhanced the antioxidant capacities and reduced the expected postprandial glycaemic responses of CSBs. Sensory analysis showed that CSB fortified with 2.5% proportion of ground linseed were most popular in acceptability profile. Meanwhile, 5% fortification of linseed granted relatively high scores to the CSB.

### **C4-2 Halalan Toyyiban assurance using fast audit observation among food truck selling chicken product In Kuala Lumpur**

Nurshahirah Saleh (UTM, Malaysia)

Purchasing and consuming foods sold by the food truck vendors is becoming a popular trend due to the current hectic lifestyle of Malaysian people. Street-vended foods are usually produced in small mobile units (e.g., vans, trailers or carts) from which food is sold, mostly with inadequate layout and equipment, frequently

associated with poor environmental sanitation, improper food handling and storage practices, as well as low quality of raw materials. The purpose of this study was to investigate the implementation of halal toyyiban practices among food truck vendors in Kuala Lumpur. Ten food trucks selling chicken products were selected from locations in Dungun and Tengah Streets in Kuala Lumpur. The method used was a fast observation questionnaire from element in Malaysia Standard 1500:2009, Malaysia Standard 2400 and Food Act 1983, which cover hygienic practices, halal logistics and transportation, halal practices and halal toyyiban control point analysis. The results show that the food truck vendors need training in handling food using food truck because standards of chicken storage and product preparation were poor.

#### **C4-3 Novel deep fried hot-pot style beef product**

Michelle Yoo (AUT)

Hot-pot is a commonly consumed dish in Asia. A thinly sliced meat, often beef, is dipped in hot soup along with other vegetables and noodles and eaten as a meal. In this study, the feasibility of a new way of cooking the traditional hot-pot style beef was studied. Premium brisket logs from Angus and Wagyu (about 30 months old) were produced to chemical lean (CL) percentages of 65 and 80%. These were frozen and sliced to 1 mm thick and kept frozen to maintain a rolled shape. One set of samples was battered and deep-fried in canola oil at 160°C for 1 min, and another set was boiled at 100°C for 30s. Eight samples were evaluated by sensory panel (n=50) for liking. Deep-fried samples were more acceptable overall ( $P < 0.0001$ ) compared to boiled. Panellists preferred the appearance, odour, first bite, and juiciness ( $P < 0.0001$ ) of the deep fried samples more than that of the boiled. Cooking method and breed had significant effect on mean ratings for beef flavour. Method of cooking, breed and CL had significant effect on tenderness, with deep-fried Wagyu 80CL having the highest shear force. Deep frying significantly reduced the collagen content ( $P < 0.0001$ ) of the samples, with Wagyu 65CL having the highest hydroxyproline content, followed by Wagyu 80CL, Angus 65CL, and Angus 80CL. Results indicated a potential for the deep-fried samples in the market as a stand-alone product in the form of a finger food, side dish or appetiser.

#### **C4-4 Exploring Chinese consumers' perceptions of functional foods**

Lei Cong (University of Otago)

China's functional food market is becoming increasingly attractive to New Zealand companies. In China, public discussion on social media regarding adverse impacts of air pollution on health and about food-related solutions is common. Using a netnographic approach we explored Chinese consumers' understanding of impacts caused by air pollution and benefits they wished to gain from food-related therapies or products. The impact of pollution on the respiratory system was considered to be of the most concern, and "moistening lungs" was the benefit, most consumers wanted to gain from food therapies or products. Children were considered to be in the most vulnerable group, as they suffered the most from persistent air pollution. Consumers living in the East, who were more highly educated, posted discussions more actively than others. Results from this study will support the commercial success of functional food products designed to help Chinese consumers recover from pollution-driven impacts.

## **D1-1 How companies embed food safety control, operator verification competencies and engagement as we prepare for the future**

Keith Michael (Food Safe)

Aiming for world class while future proofing a culture of trust: How companies embed food safety control, operator verification competencies and engagement as we prepare for the future

Technology and continuously learning FSM systems are impacting both trust and transparency in the value chain. This lecture focuses on how smart teams navigate this journey ahead. We discuss targeted solutions to help people and companies succeed:

- Key areas of focus when it comes to global and export certification programmes such as FSSC 22000 – How to get operations and quality working as one team.
  - How lean teams avoid pitfalls and harness purpose built competencies and skills aimed at efficiency.
  - Risk Management: Operator Verification – what this means in operations and how smart teams empower the entire organization towards risk control.
- Food safety culture - how this is measured, embedded and impacts trust.

## **D1-2 Managing Risk at Countdown**

Stella Stacy (Countdown)

The Countdown QA Team is responsible and accountable for making decisions about products in terms of: protecting the safety of Countdown customers; compliance (safety, ethical, animal welfare, legal compliance) and the reputation of our corporate and exclusive brands.

Key risks are to Countdown brand and reputation; and consumer loyalty and trust. Countdown have different QA requirements for suppliers which are based on risk. Find out how Countdown assesses “risk” and what these QA requirements are.

## **D1-3 Hygienic Design - Practical tools and tales**

Dave Lowry (Lowry Food Consulting)

Many Food Safety Plans are HACCP based on or embrace the principles of risk evaluation and risk management. The validity of any such plan requires that essential pre-requisite programs are in place. The most critical of these focus on hygienic design of manufacturing facilities and process equipment, which in turn determine cleanability and sanitation standards. Unfortunately, these essential support requirements are often poorly addressed through collective lack of understanding of hygienic design principles that can ultimately cause food safety and spoilage issues. This presentation focuses on the management systems required to address and sustain hygienic process environments, process tools and guidelines to deliver and recognise failings in hygienic design. Also, new initiatives are proposed to set up and establish a coordinated NZ food industry focus, aimed at addressing fundamental shortcomings in industry hygienic design covering risk evaluation, design specifications and equipment supply through to process change procedures.

## **D1-4 Achieving compliance through foreign object detection**

Robert Rogers (Mettler Toledo)

Consumer, customer and compliance demands place increased pressure on manufactures to ensure their products are of the highest quality and produced in a safe way.

There are many food safety management programs and legislation requirements where products must comply with the standards specific to the country in which the products will be sold. The consequences of getting it wrong are significant, not only to a consumer who may be hospitalised or worse, but also potentially to the store, the brand and even potentially affecting an entire market segment.

Ensuring raw materials are supplied by reliable sources and implementing a robust product inspection program throughout the manufacturing process can efficiently and effectively reduce the risk of non-compliance. A robust program includes protecting the product from foreign material; ensuring final product is properly labelled and meets all regulatory requirements.

This session will highlight common food safety practices including risk assessments, preventive control identification and implementation as well as the need for robust validation/verification and corrective preventive action process

### **D2-1 Bioactive lipids in milk of NZ dairy animals**

Kirill Lagutin, (Callaghan Institute) Andrew Mackenzie, Stephen Bloor, Dawn Scott and Mikhail Vyssotski,

Milk is not only an essential food for the early stages of development for many organisms, but also an important source of nutritional components and bioactive molecules for adults. The world milk production is almost entirely derived from cow, buffalo, goat, sheep and camel (FAO). While cow's milk was for a long time and still is the cornerstone of the NZ dairy industry, "specialty" milks from sheep, goat and buffalo have in recent years started to attract a lot of interest in various areas including infant formula formulation and production of milk products. One way such milks are promoted is unique and better-than-cow milk composition.

In this work, we analysed lipid composition of human milk and NZ dairy animals (including cow, sheep, buffalo, goat) milks. We compared the key bioactive lipids in milks – Omega3 fatty acids, trans fatty acids, conjugated linoleic acid (CLA), medium chain fatty acids (key element of medium-chain triglycerides, MCT), phospholipids (including plasmalogens and sphingomyelin), cerebrosides and gangliosides.

Although the basic lipid classes are similar between all milks there are some interesting variations in important minor bioactive components.

### **D2-2 Capturing the value of sheep milk: Opportunities and Challenges**

Li Day (AgResearch)

The New Zealand sheep milking industry is growing from predominantly small-holder businesses to a more main stream industry that includes large integrated farmers, processors and exporters. The research programme 'Boosting Exports of the Emerging NZ Dairy Sheep Industry', funded by MBIE in 2013 aims to contribute to the growth of this industry by providing new science-based evidence for improving production and the development of new high-value products. A considerable amount of data has been collected in the last 4 years to provide a baseline understanding of the nutritional composition and sensory qualities of NZ sheep milk and the impact of seasonal variation, animal feeding and processing. This information could contribute to defining future product concepts. However with a fast moving industry, there are considerable challenges (and opportunities) for research communities to work alongside the industry to ensure the research is relevant and will support the growth of NZ sheep milk exports.

### **D2-3 Sheep milk and bone health**

Keegan Burrow (University of Otago)

Sheep milk has a unique and dense nutritional profile compared to milk from other animal species commonly used for commercial dairying. Of particular note are the high concentrations of minerals, proteins and lipids present in sheep milk. Minerals from cow and goat milk have been shown to have positive effects on the development of bone structure during early growth. The aim of the research reported here is to assess the effect of New Zealand sheep milk on the growth and development of bone in a growing rat model. Newly weaned male rats (Sprague Dawley) were fed on either whole cow milk or whole sheep milk (ad libitum) for 28 days. In addition the rats had ad libitum access to a dairy-free rodent chow. At the end of the study, the rats were euthanized and the soft organs, serum and femur bones were harvested. The ultrastructure of the bones was analysed using micro x-ray tomography. Both cortical and trabecular bone segments were scanned. Multivariate analysis of bone ultrastructure data identified significant differences between the bone characteristics from rats fed whole sheep milk and those fed whole cow milk (MANOVA  $P=0.01$ ). Rats fed whole sheep milk had a higher trabecular bone surface-to-volume ratio than those fed cow milk. The cortical bone surfaces showed a similar pattern. These results indicate that consumption of sheep milk positively influences the structural integrity in bone, contributing to enhancement of bone health.

### **D2-4 Cheese with Non-bovine milks**

Simon Berry (Whitestone Cheese)

Whitestone produces 25 cheese varieties in Oamaru North Otago. Predominately cow's milk is the main stream lines, currently goat's milk supply has been secured and Whitestone have produced Sheep and Deer milk cheeses in the past. Goats milk is being converted into 5 different varieties, blue, soft white, blended and pressed varieties. There are pro's and cons of working with goat's milk around milk properties, transport and compliance and flavour profiles. Sheep milk is a more difficult milk to source and also has variable properties to adjust to. Deer milk is incredibly difficult to milk and the provide a sustainable milk supply. The properties of this milk are at the extreme scale of milks to work with. All non-bovine milks provide different properties, however each have their own challenges to ensure a sustainable model can be achieved.

### **D3-1 High-Value Nutrition National Science Challenge – Transforming NZ's food and beverage research landscape**

Joanne Todd (University of Auckland)

High-Value Nutrition (HVN) is focused on delivering translational science to enhance NZ's competitive advantage and drive innovation and value generation in the food and beverage sector. Positioned at the public/private research interface, four long-term health themes have been defined and are establishing new research methodologies and biomarkers to validate food-health relationships. Complementary to these, are a series of shorter-term industry aligned projects, developing evidence of the health benefits of particular NZ foods. Underlying projects to develop a better understanding of consumers' motivations and preferences, and ensuring the integrity and bioavailability of bioactives along the food value chain support the overall programme. HVN will enable the transformation of the research landscape, bringing together the best research

teams from across the country, collaborating on common objectives. Integration of consumer insights, nutritional research, food science and industry expertise will enable the development of high-value foods and the growth of NZ's export economy.

### **D3-2 Sugar reduction – an opportunity for voluntary action by the food industry**

David Monro (Heart Foundation)

There is increasing pressure for food manufacturers to prioritise sodium and sugar reduction in processed foods.

Since 2007, the Heart Foundation has implemented a food reformulation programme focused on reducing salt levels in 17 food categories. The programme is Ministry of Health funded and involves establishing voluntary nutrient targets and timeframes in partnership with the food industry.

The objective of the programme is to have at least 80% of the market share meeting the targets, which ensures high-volume foods in the category are prioritised. This objective has been met in the majority of key categories (such as bread, breakfast cereals, processed meat) with over 300 tonnes of salt per annum removed through reformulation.

Since 2016 sugar reduction targets have also been set. While there are a range of commercial, technological, and consumer challenges to sugar reduction, the initial responsiveness of New Zealand food companies to the targets has been positive.

### **D3-3 Knowledge for health communications**

Juliet Ansell (Zespri)

We know from consumer research across several of our key markets that health knowledge drives consumption. The more consumers know about the health benefits of kiwifruit; the more they consume. As with many consumer facing businesses there are rules and regulations about communicating directly and indirectly with consumers. Each market has their own regulatory body and a set of rules and laws that govern health claim legislation. Primarily these regulatory bodies are there to protect consumers. At Zespri we believe in integrity and we fully embrace these regulations and stand behind everything we communicate on to consumers. To do this we invest in health research in order to provide the scientific evidence needed to back up these health communications. We aim to have a stream of new news to engage in conversations with health influencers (e.g. doctors and dietitians) and where appropriate, directly with consumers.

This season we will be communicating on the digestive health benefits of kiwifruit and building on some new research we have obtained since last season. This includes a trial with our SunGold variety, and obtaining low FODMAP accreditation from Monash University. We are also starting to plan for the new messaging for next season. This talk will explain the process from identifying an area that resonates with consumers, the research pipeline and the translation into health communications.

### **D3-4 Accessing strategic food information for product development and marketing**

Carolyn Lister (Plant & Food Research)

The New Zealand Institute for Plant & Food Research Limited (PFR) and the Ministry of Health jointly own the New Zealand Food Composition Database, the most comprehensive and up-to-date collection of detailed food and beverage composition and nutrient data in Australasia. Until recently, this information has only been

accessible *via* The Concise New Zealand Food Composition Tables and FOODfiles™. PFR recognised that the database needed to be able to be searchable online, so that other users could access the data and make further use of it. Hence, a new search functionality has been added to the foodcomposition.co.nz website. This tool allows users to produce a number of different outputs, including Nutrition Information Panels and lists of claimable nutrients for a food, and allows for the production of a list of foods and ingredients high, or low, in a particular nutrient. These outputs will assist the food industry in product development and marketing and provide information for people to make healthier food choices.

#### **D4-1 Purification and characterisation of the cell envelope proteinases from *Lactobacillus delbrueckii* subsp. *Lactis*313**

Dawei Ji (University of Otago)

Cell-envelope proteinases (CEPs) expressed by *L. delbrueckii* subsp. *lactis* 313 (ATCC 7830) are a special class of extracellular proteolytic enzymes, which could improve the texture and organoleptic characteristics of fermented dairy product and release some bioactive peptides encrypted in milk proteins. This presentation will introduce the proteolytic system of Lactic acid bacteria and several steps of CEPs extraction and purification. And then, the catalytic characterisation of CEPs will be discussed, such as temperature and pH value optima, molecular weight, and suitability of CEPs from ATCC 7830 to degrade milk proteins into peptides. Finally, the potential application of CEPs in food industry will be discussed.

#### **D4-2 Role of mono- and diglycerides in protein-stabilised emulsions**

Marcus Loi (University of Otago)

Protein-stabilised emulsions form the opaque appearance in beverages such as dairy and non-dairy milks that contain dispersed lipid droplets in the water phase. Whilst protein is an important surfactant to form an emulsion, mono- and diglycerides interact with the protein to modify emulsion droplet size and stability. The differences in density between lipid droplets and the aqueous continuous phase can lead to the formation of a cream layer at the top of an emulsion. This study aims at understanding the effect of different mono- and diglycerides on physicochemical properties and creaming stability of an emulsion. A microfluidiser was used to form model emulsions with different mono- and diglyceride compositions. Results showed that an emulsion containing mono- and diglycerides produced 15-30% smaller droplets and 17-27% lower polydispersity indices compared to the emulsion with protein only (control). All emulsions containing unsaturated mono- and diglycerides kept for 28 days showed less creaming compared to the control. However, the emulsion series containing saturated mono- and diglycerides did not show better creaming behaviour than the control. Unsaturated mono- and diglycerides are therefore promising emulsifiers to improve creaming behaviour of beverage emulsions. This information is useful to formulate protein-based beverages with uniform particle suspensions that allow better shelf stability during storage.

#### **D4-3 Evaluation of syneresis and salt transport in cheese curds: the role of porous structure and pressure gradients**

Meghan Keck (Massey University)

Understanding the mechanisms governing the movement of whey and salt through fresh cheese curds during cheesemaking is essential to the production of safe and consistent cheeses with desired functionalities, flavour, and shelf life. A

fundamentally-derived mathematical model was developed to model the uptake and transport of salt and moisture through fresh, dry-salted cheese curds by defining the curd as a proteinaceous matrix with whey-filled, interconnected pores and accounting for the effects of osmotic pressure gradient induced whey expulsion. A novel image analysis technique was developed to evaluate gel volume and surface area contraction with respect to syneresis time and exposure under in situ conditions, comparable to the vat conditions occurring during large scale manufacture of cheese. A series of experiments with renneted milk gels at different pH values and exposure to induced osmotic pressure differentials were conducted to evaluate the changing syneresis behaviour as functions of syneresis time and osmotic stress effects. Evaluation of internal porous structure was also performed on the gels with scanning electron microscopy to describe the average changing internal porous structures and calculate the average pressure gradient driving syneresis. Results show macro-scale gel contraction and reduction in internal porosity follow first-order kinetics and that the presence of an osmotic stress differential creates a step change in the macro-scale and internal meso-scale contraction. The model and findings provide an essential step to describing the governing mechanisms that control the uptake and transport of salt and moisture during the salting process of cheesemaking.

#### **D4-4 Bradford assay to evaluate casein micelles depletion flocculation in milk-oat beverages**

Mario Alayon (Plant & Food Research)

Proteins-polysaccharides are present in a large number of food formulations for their sensorial and/or nutritional functions. It is well known that in the formulation of dairy products that contain milk-oat, the depletion flocculation of the casein micelles can happen due to the  $\beta$ -glucan-casein interactions. Some of the techniques used to evaluate this interaction are light scattering, microscopy and rheology. Bradford assay was used to evaluate the depletion flocculation of the casein's micelles in a milk-oat UHT beverage at different oat concentrations.

Bovine serum albumin (BSA), whey protein, milk protein concentrated and sodium caseinate were used as standards for the Bradford assay. Results from the Bradford assay using concentrated milk protein and sodium caseinate as standards were accurate. A phase separation within the milk-oat beverages at 8 and 15% (w/w) was clearly observed, being consistent with the reduction of the protein concentration on the top of the beverages obtained using the Bradford assay.

## DAY 2 - Wednesday 4 July

### **E1-1 Creating a trusted media presence: from ivory-towered academic to “pink-haired science lady!”**

Siouxsie Wiles (University of Auckland)

In this era of ‘fake news’, food scams, and ill-informed bloggers, effective science communication is vital for maintaining public trust. Associate Professor Siouxsie Wiles has made a career of manipulating microbes in an effort to understand how bacteria make us sick and to find new medicines. She is also an enthusiastic tweeter, blogger, artist, curator and media science commentator. In her presentation, Siouxsie will talk about her journey from ivory-towered academic to becoming an engaging and trusted public communicator of science and will give her top tips for how people can go about getting their messages out to the public.

### **E1-1 Science in the media – hype, spin and what experts can do to help**

Dacia Herbulock (Science Media Centre)

Food safety concerns, nutritional fads and health claims feature prominently in the media. Lifestyle and wellness topics are ever more popular, and consumer-focused news often sees marketing claims repeated uncritically. Against this backdrop, reporters increasingly rely on trusted sources and independent experts to help them separate spin from solid evidence. Yet all too often, time pressures, competing interests and experts’ inaccessibility interfere. In this talk, we’ll explore the challenges and opportunities facing scientists seeking to improve the ways their areas of expertise are covered in the media.

### **F1-1 Food Fraud Vulnerability Ranking Tool**

Fernando Lopes (University of Auckland)

The purpose of this study was to develop a robust method for ranking food ingredients regarding food fraud vulnerability. The tool is completely customisable and divided into three main modules: public health impact, vulnerability assessment, and economic impact. Public health criteria were based on nearly 1,000 records of food fraud incident worldwide from the most comprehensive data collection recorded in the United States Pharmacopeia Database. Food fraud vulnerability criteria considered literature reviews and expert panel recommendations and the economic impact considers company-specific data. The user can customise the relative weights, and design or adjust criteria of the tool. In short, the tool has been transformed into software and applies a semi-quantitative risk ranking methodology similar in principle to the US-FDA risk-ranking tool for fresh produce microbiological hazards and to the model used by MPI to update the entire legislation as to what is called a risk-based approach

### **F1-2 Fraudulent manipulation of bioactivity of Mānuka Honey**

Merilyn Manley-Harris (University of Waikato)

The bioactivity of mānuka honey is principally due to the presence of unusually high levels of methyl glyoxal (MGO), which is a potent antibacterial agent. MGO arises in the honey by chemical conversion of dihydroxyacetone (DHA), which in turn derives from the nectar of the mānuka flower and other flowers of other trees of the *Leptospermum* genus. NZ government guidelines do not specify levels of MGO or DHA for the designation of mānuka honey, since there is considerable natural variation, however wholesale and retail prices are critically dependent upon DHA

and MGO levels. Fraudulent manipulation of bioactivity by addition of MGO and/or DHA during processing is possible and is undoubtedly occurring. This talk will examine the methods of detection of such fraud.

### **F1-3 Building confidence in your supply chain**

Pam Whitfield (Asure Quality)

Food and beverage supply chains can be complex. Trust in the quality and authenticity of finished product requires confidence in all components of the supply chain, from ingredient suppliers to in-market partners. This talk focusses on measures that can be used to build and support this confidence, including some key areas to watch out for, and an overview of food fraud mitigation approaches (VACCP and TACCP).

### **F1-4 Responding to food fraud and food defence issues – MPI’s role**

Stephanie Rowe (MPI)

MPI’s purpose is growing and protecting NZ and our ambition is NZ is the most trusted source of high value natural products in the world. Food fraud and food defence risks have the potential to cause major harm to human health and economy.

Stephanie leads MPI’s Compliance Services Directorate, which is MPI’s compliance and enforcement group and will cover:

- our work in improving the trust in and integrity of New Zealand’s food safety systems
  - the approaches used in managing reports of food fraud and food defence
  - how to report potential concerns/issues
- recent NZ examples of food fraud and food defence.

### **F2-1 Science and technology vs customer expectations in the meat industry**

Kevin Cresswell (MIA)

In today’s world there is ever increasing knowledge in the food science and technology space. In addition, customers’ and countries’ requirements are becoming more sophisticated and not necessarily science based.

This presentation discusses some examples in the meat industry of tensions between science and technology, production capability and customer expectations.

### **F2-2 A new class of lamb – The Omega Lamb Project**

Gary Maclennan (Alliance)

The Omega Lamb Project is a Primary Growth Partnership (PGP) programme involving leading food company Alliance, a group of innovative farmers known as Headwaters and the Ministry for Primary Industries (MPI).

Ten years of scientific research in the areas of animal genetics and agronomy have lead to the development of a new breed of lamb and a specialized production system which delivers a unique nutritional composition and flavour profile.

The programme incorporates technologies which provide traceability from farm to plate.

New innovative measurement technologies based on NIR have been developed and integrated into the manufacturing process to provide assurance that products meet tight specifications for key quality attributes.

The programme has seen the launch of the TE MANA LAMB brand into high value market channels across the world. Winner of the 2017 NZ Innovation Award (Food

and Beverage Category) a range of new added value product forms are progressively being developed.

### **F2-3 Scott Technology – Automation and Robotics in the meat industry**

Andrew Arnold (MIA)

Over the past 18 years Scott Technology Ltd (Scott) has undertaken an innovative project to automate Lamb Boning. Starting with very little experience in the meat industry, Scott has gone from specialising in industries where product inputs were defined and predictable to dealing with product which is naturally varying and every animal is different.

Scott is now viewed as one of the most innovative suppliers to the industry, offering a range of products along with further development of automated boning solutions for the processing of other species in the meat processing industry.

### **F2-4 Value addition to New Zealand meat through processing**

Lovedeep Kaur (Massey University)

The global demand for diverse, nutritious protein-rich foods is increasing due to increasing population and consumer awareness. The proportion of animal protein in the diet is also expected to increase with income per capita, particularly in the Asian countries. The opportunity here is for New Zealand to develop processed meat foods, targeted to both traditional and emerging markets to generate higher export income. We are applying innovative processing technologies, such as shockwave and high pressure processing to low value meat sources in order to develop foods with new textures. The aim is to improve the digestibility (protein digestibility and digestion kinetics), texture and flavour (and thereby appeal and value) of the meat foods, with particular attention to lower value meat cuts such as brisket. The preliminary results from our recent experiments will be presented and discussed.

### **F3-1 3D Food Printing**

Richard Archer (Massey University)

That 3D printing will be applied in the food industry is inevitable. No technology with that power and flexibility misses out on being used in what is still the largest manufacturing industry in the world. But how is it being applied? Where does it fit and where does it not? Which of the modes of 3D printing lend themselves to food printing? Who are the first movers and where will it go next? Already some players are printing food itself. Others have made food utensils and some have made components of food manufacturing equipment. This talk will cover the printing of food itself and associated research and commercial activity.

### **F3-2 Rapid Freezing of Sheep Milk**

Jolin Morel (Massey University)

The NZ sheep dairy industry is small, but growing rapidly. The industry consists of a small number of large, vertically integrated producers, and a larger number of small producers selling to cheese makers or aggregating milk with other producers for drying. A farm may take a month to accumulate enough milk for a production run and may be 500 km from the factory.

Massey University is developing a system for freezing milk on farms, and storing until transport and processing. The key is to freeze milk very rapidly to limit separation into zones of pure ice and of concentrated milk solids. Over time, the concentrated milk solids can knit into insoluble knots, resulting in an unstable milk

on thawing. The milk is also flaked, so it is easier to thaw than milk frozen in large bins or blocks.

This new system has a series of internally cooled vertical tubes covered with a falling film of milk. The milk freezes onto the vertical surface. Frozen product is removed once it has reached a desired thickness, and broken into flakes. To help detach ice from the freezer surface, GNS Science has developed ice-phobic stainless steel surfaces.

### **F3-3 Infrared Spectroscopy as a process control tool for the perfect caramel**

Peter Swedlund (University of Auckland)

Caramelisation is a rich and complex process. Optimisation traditionally involves subjective methods and we explore the use of mid infrared (IR) as an objective tool. Systems of incrementally increasing complexity were studied; from simple sugar solutions to caramelised sugars to complex systems including cream. Principal Component Analysis (PCA) of the IR spectra of mixes of sugars could identify the components and their concentrations. During caramelisation of sugar solutions there were IR spectral changes across the temperature range and PCA provided a clear discriminating function across the entire temperature range with a large change in PC1 going from an insufficiently caramelised sample to an over caramelised sample. Experiments with emulsified systems that included a cream revealed IR spectra that contained an additional source of variance produced by the length scale of the dispersed phase ( $\approx 100 \mu\text{m}$ ) which is much larger than the IR path length. Therefore the proportion of lipid and water/carbohydrate sampled depends upon an arbitrary factor of the lipid droplets arrangement in relation to the IR beam. None the less, PCA of these spectra produced a series of parallel lines in which each line was offset depending on the degree of caramelisation as indicated by temperature. At a given degree of caramelisation, the position of the sample within a line depended on the ratio of O-H and C-H stretching band areas. Mid IR can therefore be used as an optimisation tool for these complex system.

### **F3-4 Development of high-value protein products**

Cynthia Sun (Callaghan Innovation)

This presentation will provide an overview of the science capabilities of IBT of Callaghan Innovation in the area of product development related to proteins and enzymes. A couple of examples, namely lactoferrin analysis in milk and bioactive protein hydrolysates, will be discussed in detail to showcase our key expertise in high value protein product development.

### **F4-1 Modelling of the moisture sorption isotherm of fruit juice powders**

Sebastian Linnenkugel (Massey University)

The physical stability of food powders is strongly connected to the moisture content and the associated water activity of the powder. This relationship between water activity and moisture content can be represented by the moisture sorption isotherms. The most common method is fitting of the experimental data to different sorption models such as the GAB or BET models. For each product the moisture sorption isotherm has to be determined individually, which makes the procedure very time consuming.

In this work, a modified version of the Flory-Huggins free volume model has been used to predict the moisture sorption isotherm determined on the composition of blackcurrant juice powder. In the Flory-Huggins model the interaction parameter of water with each component and the free volume was considered as an average of

the composition. The clear blackcurrant juice was mixed with maltodextrin DE 9-13 to have a ratio of 4/6 for blackcurrant solids to maltodextrin and spray dried in a pilot scale dryer. The experimental data for the moisture sorption isotherm of the blackcurrant juice powders and as a comparison, pure maltodextrin, was measured using standard saturated salt solutions and a dynamic vapour sorption method. The predicted sorption isotherm exhibits a good correlation to the experimental data. The modified Flory-Huggins model gives an alternative approach to approximate moisture sorption isotherm on one phase systems.

#### **F4-2 Atomisation of fruit juices**

Siti Nadjiha Moda Rozali (Massey University)

To successfully spray dry a fluid it must firstly be atomised. Spray drying of fruit juices is desirable as the powders are easier to handle, especially for storage and transportation. Commercially, maltodextrin is added to fruit juices as a drying aid to increase the efficiency of the spray drying process. One study has shown the potential use of carrot fibres to replace the maltodextrin as a drying aid. Pomace fibres, originally derived from the fruit itself, which will ensure the clean-labelling of the fruit juice powders are a potential alternative drying aid. However, the addition of micro-sized fibres to fruit juices affects the rheology and subsequent atomization behaviour during the spray drying process. Unlike atomization of fruit juices with maltodextrin, which is easy and has been in practice since previous decades, atomization of fruit juices with fibres has never been investigated.

The aim of this study is to atomize fruit juices with fibres as the drying aid.

Problems encountered due to the complex rheology of the fruit juice fibres will be explained. The atomization behaviour of the fruit juice plus fibre mixtures will be shown along with the potential solutions to ensure an efficient atomisation of fruit juices fibres in a spray dryer.

#### **F4-3 Model pectin reactions in the heat treatment of apple pomace**

Florencia M Yedro (Plant & Food Research)

New Zealand has typically generated approximately 25,000 tonnes/annum of apple pomace after juicing. This represents an opportunity if pomace can be induced by processing to acquire useful functional properties. Thermal treatments can both solubilise components and modify the cell structure. Pectin, one of the main carbohydrates, starts to solubilise at lower temperatures compared with hemicelluloses ( $>120^{\circ}\text{C}$ ) and cellulose ( $>180^{\circ}\text{C}$ ). Acid hydrolysis,  $\beta$ -elimination and demethylation reactions in pectin are the key reactions behind structural change affecting texture, mouthfeel, flavour, ability to stabilise and probably behaviour during digestion.

A kinetic model was developed to predict the optimum thermal conditions to minimize or maximize the effects of these reactions, depending on the desired final product. The model assumed contributions from consecutive and parallel first-order reactions balancing the number of glycosidic linkages and methyl groups in solution. The model allowed prediction of the galacturonic acid content and the degree of polymerization of pectin in both the solid and liquid phases. The predicted values were compared against experimental data collected for batch samples heated to 90-140°C in a small-scale (12 mL) batch reactor for 120 min to 360 min. After the reaction, a liquid rich in pectin and hemicelluloses and a solid rich in cellulose were obtained. The pectin, reducing end groups and unsaturated uronide contents, and degree of methylation, were measured. This model can be

used to identify the processing conditions required to transform the pomace into different products, saving time, money and resources.

#### **F4-4 Frictional smoking of food**

Muhammad (Moha) Seraj (Massey University)

Food smoking is a method for adding value to products. One method of producing smoke is frictional heating of wood by forcing it against a spinning wheel or disc. Friction produces heat which raises the temperature in contact to induce decomposition of wood. Here, we investigate the smouldering limit for smoking using a lab-scale friction smoker, with measurements of the power draw, wear rate and interfacial temperature, for a range of contact pressures and sliding speeds, for a knurled spinning wheel, using Manuka wood. We show that the onset of smoking is most heavily dependent on contact pressure over the typical range sliding speeds, and that the wear rate goes through a temperature dependent transition relating to the changing mechanical properties at the interface as the wood decomposes.

#### **F4-5 Investigation of the use of Ultraviolet followed by heat for spore inactivation**

Jawaad Ahmed Ansari (University of Auckland)

Spore forming microorganisms are major contaminants in the dairy industry since they are highly resistant to heat, and significantly affect product safety, quality and shelf life. Presently, milk is sterilized by using Ultra high-temperature treatment at 135-140 °C for short duration to inactivate spoilage and pathogenic type of microorganisms including spores. However, such high-temperature results in adverse changes in milk including color and sensory changes, loss of nutrition content and rheological changes. These adverse changes are attributed to oxidative and Maillard reactions. Maillard reaction is one of the reaction which results in changes in nutrition value, sensory properties and lipid oxidation. Emerging technologies possess tremendous potential to reduce impact of thermal treatment. Ultraviolet (UV) radiation in the UV-C range is commonly used for sterilization of water because of its low energy consumption and suitability to a continuous production environment. However, UV-C treatment has a limitation in its transmission through opaque liquids like milk. Hence, UV alone is not sufficient to sterilize milk. In this study, the effect of UV-C treatment on heat sensitivity of spores was analyzed for different types of milk using *B. subtilis* and *G. stearothermophilus* spores as surrogate organisms. UV-C treatment followed by heat results in synergistic effects on inactivation of spores. This hurdle treatment could provide sterilization at reduced temperature, which would result in a milk with improved quality and a process low energy consumption.

#### **F4-6 Pulsed Electric Fields industry research under FIET programme**

Indrawati Oey, (UoO)

Pulsed electric field (PEF) technology uses short, high voltage pulses to create an electric field, which could result in the formation of pores in the cell membrane. PEF can modify food structure and functionality and enhance extraction efficiency (yield) and composition, while retaining nutritional quality. Through the creation of these pores, small molecules are able to escape while larger molecules are retained; this may be valuable to enhance extraction efficiency. Structural changes make materials easier to cut/ shape, reduce fat uptake, speed up diffusion processes and reduce raw product heterogeneity. Due to the ability to precisely target and control the process, it can be expected that the end-product will

retain most of its nutritional value along with enhanced physical properties. PEF is becoming widely used internationally but the complexity of interactions within the electric field means that each PEF application has to be carefully designed to suit the raw materials and desired product outcome.

PEF can decrease the impact of raw material variability and improve competitiveness by increasing throughput, improving yield and decreasing production costs. Such issues are currently facing our industry partners. In NZ there are many opportunities for PEF's use as processing-aid that capitalise on different aspects of PEF and the respective industry/market needs. In this presentation, several case studies conducted under Food Industry Enabling Technology (FIET) programme will be discussed.

#### **F4-7 UV Technologies for fresh blueberry exports**

Gonzalo Martinez (Massey University)

The largest markets for blueberries are in Asia-Pacific and Europe. This is an advantage for NZ growers as they can offer products out of season at significant margin. However, exports to those regions are limited by shelf-life which must encompass shipping and distribution times. Blueberries are highly valued as healthy food partly because their high antioxidant levels. To maintain this quality, fresh blueberries are not disinfected to reduce the chance of rot. Therefore, potential outbreaks are a latent risk. For these reasons, this project provides a system that increases shelf-life, antioxidant level, and disinfects fresh blueberries based on UV light. Literature shows that UV light can significantly increase blueberry shelf-life up to 7 days. The increase was also achieved for anthocyanins and phenolic compounds after treatment with UV light. Our research showed that UV disinfection of fruits inoculated with E. Coli was rapidly achieved. These findings give an opportunity to scale the process to commercial prototypes.

#### **F4-8 A compact ice storage battery for on-farm cooling of milk**

Refat Al Shannaq (University of Auckland)

Cooling is one of the major energy consuming processes in industry; thus design of efficient and reliable chilling processes is an important requirement in many fields such as on farm cooling of milk, food processing, air-conditioning, cooling of high power electronic devices, and other industrial process applications. The introduction of cold energy storage can be effective at reducing peak energy demand, by shifting most of the load consumed by the chiller from peak to off-peak times, which could lead to significant energy cost saving. Furthermore, cold energy storage can also eliminate the need for the chiller to operate at peak load. Instead, the chiller equipment only needs to meet total average load requirements. This reduces the capacity and cost of chiller equipment, and minimizes the amount of refrigerant needed. This paper investigates the development of a simple, compact, high-density, ice-storage battery suitable for use on dairy farms for cooling of milk. The thermal performance of the developed ice storage battery at different heat transfer fluid (HTF) inlet temperatures and volumetric flow rates were predicated using ANSYS/CFX software based on the enthalpy porosity concept. The required cooling load could be achieved for a range of HTF inlet temperature and volumetric flow rate operating conditions, where a lower flowrate is required with an increase in the HTF inlet temperature.

### **H1-1 Top tips for exporters**

Chris Boys (Katabolt)

Chris Boys has spent half his working life offshore or selling NZ products into offshore markets.

Having worked with a large number of companies across a range of sectors, Chris and the Katabolt team know what it takes to make sure you get your product into the right market at the right time. During this presentation, Chris will share with you his top tips when it comes to exporting, share some stories of success, but also the pitfalls and what to avoid when it comes to expanding your business into new markets.

### **H1-2 Some learnings from our export journey**

Michael Barker (ex Barkers)

Exporting is often said to be a quick and profitable way to grow a new entrepreneurial food business. In our experience this is much easier said than done. I will share my thoughts on the lessons that Barker Fruit Processors have learnt over many years trying to build profitable export markets in Australia and Asia.

### **H1-3 The global interest in New Zealand's indigenous ingredients**

Craig Armstrong (NZTE)

NZ has a very bioactive and unique fauna and flora. Global food and beverage is shifting from processed to healthy natural foods, and the role of food and nutrition for health and wellness is now spilling over on the personal care industry. What trends can we leverage?

And yet, NZ SME business expertise is often singular (either sourcing, or manufacturing, or marketing) rather than multi-dimensional. A domestic operation built around a founder or a strategic asset rarely succeeds internationally. What is an optimal growth plan that helps defend your market share and proposition from competitors? When should you leverage the capabilities of other market participants to mutual benefit? What do we have a chance of being "best in the world at"?

This session will highlight some of the global interest and underlying trends that could work for your brand, ingredient or business.

### **H1-4 Supporting New Zealand companies to internationalise – bigger, better, faster – for the benefit of New Zealand**

Jenny Milson (NZTE)

Exporting of goods and services is well understood to be critical to the ongoing economic and social wellbeing of New Zealand. Exporting as part of an overall growth strategy for any business requires planning, preparation, research and resources in order to optimise the likelihood of success. There is an ecosystem of support organisations that NZ exporters can tap into to assist with all the steps required. The presentation will primarily cover how New Zealand Trade & Enterprise, as the Government's trade development agency, works alongside NZ exporters to add value at the varying stages of their export journey. In addition it will outline what other agencies and organisations exist and the various points in the journey they can provide value.

## **H2 -1 The “sweet” effect: Comparative assessments of dietary sugars on cognitive performance**

Dr Mei Peng (University of Otago)

Effects of sugar have fascinated researchers across many disciplines, including food scientists, nutritionists, psychologists, health professionals, and even YouTube experimenters. While extensive attention has been given to the health impacts of various sugars, little is known about their cognitive effects. To begin to bridge this research gap, we tested in 49 people the effects of three common dietary sugars (i.e., glucose, fructose, and sucrose), against a placebo sweetener (i.e., sucralose), on performance of three well-studied classic cognitive tasks, all of which are suggested to relate to the prefrontal lobe. Results revealed that ingestion of glucose and sucrose led to poorer performances on the assessed tasks as opposed to fructose and the placebo drink ( $p < .05$ ). Our study adds to the growing body of literature concerning sugar effects on behavioural and cognitive performances. Findings from our study also highlight the importance of considering cognitive effects in future food research.

## **H2-2 The future context for Consumer and Sensory Science**

Julia Low (Massey University)

Traditionally sensory scientists are taught to investigate the response of individuals in a controlled laboratory setting – including control of the stimulus, the participants, and the environment. Whilst existing traditional sensory evaluation instruments in a controlled laboratory environment provide information on consumers’ perception of foods, the environment bears little resemblance to actual food perception in the “uncontrolled” real world. Rather, the context in which consumers eat foods provides a more accurate representation of their perception of the consumed foods. With the help of recent technology to stimulate different realistic contexts, moving consumer sensory research beyond the controlled laboratory setting is now possible. This talk reviews current sensory research in this area, including evoked contexts, immersive environments, virtual/mixed reality, and real contexts and the relative merits of the different approaches.

## **H2-3 Achieving salt reduction by asking consumers**

Pat Silcock (University of Otago)

Food manufacturers are under increasing pressure to reduce the sodium content of their food products by reducing the salt content due to health concerns. However, salt is a critical component of flavour and as such affects product acceptability. In general, consumers will not notice small reductions in salt content (around 10% reductions) with no impact on liking. However, it is difficult to determine how much reduction is too much, which may lead to product failure.

The best way to address such questions is to ask the consumers of the products in question. In these situations asking an acceptability question is generally not conclusive due to the variability in consumer responses, which can make it difficult to determine the salt concentration where changes in liking occur.

To address this question a rejection threshold test can be used to identify the minimum amount of salt that can be incorporated in the food before a change in preference is observed by consumers. Determining the consumer rejection threshold involves asking participants a series of forced choice preference questions to generate a concentration-dependant response in order to determine whether concentrations are acceptable, i.e. how much is too much/too little.

In this talk we will illustrate how the consumer rejection threshold can be applied in conjunction with free comment analysis to determine salt reduction limits using three product variants as examples.

## **H2-4 Understanding 'Uniqueness' for guiding Product Development of high value New Zealand exports**

Tracey Phelps (Plant & Food Research)

'Uniqueness' is a characteristic of products that are highly valued and highly differentiated from other products in their category. The advantage of unique products is that they are insulated from competition from other brands. Yet, in spite of its importance for product and brand success, 'uniqueness' has not received attention from a psychological, consumer or food research perspective. New Zealand's size and geographical location make it difficult to compete in the high volume, low priced commodities market, thus products need to stand out and demand a premium in the global marketplace. In order to define uniqueness as a useful parameter for within the context of product development, we asked consumers to assess a set of New Zealand beers using a set of variables that had been suggested in earlier studies to act as important underlying dimensions to define products as unique. The variables; novelty, complexity, positive hedonic and emotional character, when considered together were able to group the different beers beyond liking, to give a more complete assessment of market potential. We have latterly extended the application of this approach to another product category (chocolate) to demonstrate its possible value to wider industries as well, not just beer.

## **H3-1 How Amazon is grabbing their share of the expanding meal kit market**

Hamish Conway (Sell Global)

Amazon is making a play for the US nearly \$1 Trillion food market including the Meal Kits market.

With Amazon's acquisition in 2017 of Wholefoods it's opened up the opportunity for going head to head against the other big Meal Kit providers such as Blue Apron and Purple Carrot.

Amazon's fulfilment infrastructure allows it to offer same day delivery of ingredients for recipes created by Allrecipes.com.

Given Amazon's deep pockets, consumers trust of the brand in the USA, they will be a strong bet to win the race.

## **H3-2 Beef as a central ingredient in meals**

Mustafa M. Farouk (AgResearch)

For years meat research has prioritised the study of meat as a standalone entity, with a view to understanding its table- and manufacturing-qualities, composition and nutrient density. Much less is known about its attributes in the context of designing meals where meat is a central ingredient, with a specific functionality or consumer in mind. For instance, (1) apart from the familiar characteristics of tenderness, colour, flavour, water and fat binding abilities or how to manipulate those, what information is needed to design a meal tailored to individuals? (2) beyond nutritional composition, what else drives consumers to choose meat? (3) what features or functionality are important following meat consumption?

As part of research investment into wider applications for NZ's red meat resources, we are studying red meat and offal digestibility, because this attribute is relevant to consumers across a wide range of demographics, physiologies and lifestyles. Our

research is considering the inherent characteristics of meat that influence its digestibility; the most frequent accompaniments in meat-centric meals and their reciprocal effects on digestibility; and ways to use this information in the rational design of meals tailored to consumer interests and requirements. This presentation summarises outcomes of a number of studies that collectively answered some of the questions raised. The data are intended to support a scientific basis for the designing of meals based on beef as a central ingredient and digestibility as the target functionality.

### **H3-3 Delivering nutrition**

Sam Bridgewater (The Pure Food Co)

The Pure Food Co deliver fortified food to the majority of NZ Public Hospitals, as well as many of the leading aged care providers.

Designing natural products that deliver on sensory appeal, as well as mouthfeel and nutrition presents a food technology challenge to ensure the product ranges support the health and happiness of the consumer.

Combining food science, nutritional science and innovation, Pure Foods continue to develop products to provide good nutrition for our elderly.

### **H3-4 Developing private label products for a market hungry for innovation**

Jill Soufflet (Foodstuffs)

The Pams brand is iconic and over its 80 years has become a New Zealand household name. With annual sales of over \$1 billion and over 2000 SKU we are New Zealand's biggest selling grocery brand.

As the New Zealand supermarket industry has evolved so too have our brands. With a clear 'good, better, best' tiering across Value, Pams and Pams Finest, supported by sub-brands like Pams SuperFoods, Pams Organic and more, each range is targeted at a particular segment of the market while hitting clearly defined quality requisites and pricing.

The proliferation of TV cooking shows and more recently food blogging and social media posts, has given us confidence to try new cooking techniques and flavour combinations. Visibility of the array of innovative and convenient offers in other countries has whet our appetites for meal solutions both in supermarkets and through services like My Food Bag, which make it easy to eat well at home.

I will speak about how Private Label products are to not only relevant to these trends but in many cases leading the market.

### **H4-1 Opportunities for utilisation of co-products from the meat industry**

Alaa El-din Bekhit (University of Otago)

With increased future demand for food forecast, the demand for additional sources of protein will increase, in part due to global economic and demographic changes. Better utilisation of agricultural waste product streams has considerable potential, in addition to better land use and enhanced agricultural production,. Substantial protein-rich waste streams are generated from the wine, dairy, edible oils, marine and meat industries. Our multidisciplinary group has had a vision for over 15 years to research the extraction and biotransformation of these protein resources to develop better utilisation. The meat industry is of particular interest as it produces a wide range of biological materials requiring novel solutions to add value to these resources. The recovery of protein and gelatine from offal and organs not traditionally consumed in Western diets has been investigated and practiced for decades. Efforts to devise novel processes to recover proteins for enhancement of

protein quality in fortified meat analogues have been investigated globally since the 1980s, but with limited commercial application. However, there has been renewed interest in the production of peptides from protein hydrolysates that can be used for nutraceuticals, supplementation and flavouring compounds. Peptides with a variety of properties can be generated from protein-rich waste streams depending on the chemical or enzymatic methods used and the extent of hydrolysis. These methods offer opportunities for processing of unconventional materials such as blood, wool slips and tendons that can add value to these streams. This presentation will discuss current uses of meat co-products, legislative issues and opportunities for co-product utilisation.

#### **H4-2 Gaining greater value from low value meat processing streams**

Santanu Deb–choudhury (AgResearch)

Co-products and waste streams from the meat industry processing are probable sources of as-yet-unmarketed highly functional and valuable components. Targeted application of such components may lead to the development of new ingredients. Organ meats, in particular, pose an opportunity for the development of amplified flavour ingredients. New flavour ingredients could be used, for example, in plant protein-based extruded products for delivering authentic meaty flavours. Natural bioactive peptides categorised as tastants have a positive impact on flavour development and can be used instead of current meat flavouring agents that are dominated by starch and sugar variants. Our work to date has shown that tastants can be generated and extracted from meat and organ combinations using hydrothermal pressure extraction. Advanced proteomic and bioinformatics techniques have been used to determine the type and quantity of these tastants. Tastants may potentially be used both to influence taste qualities in food and healthy eating and as a natural ingredient replacement for food seasoning. Tastants obtained from organ meats will provide additional value for these meat co-products.

#### **H4-3 New Omega-3 enriched fish oil products from New Zealand fish by-products**

John Birch (University of Otago)

Fish oils are a natural source of healthful long chain polyunsaturated fatty acids (LCPUFA), derived from their diet that includes algae and krill. The principal fatty acids are DHA, EPA, SDA, and these have recommended guideline levels of omega-3 intake set down from the Global Organisation for EPA and DHA (GOED). This presentation backgrounds the fatty acid analysis and their positional distribution of LCPUFA on the triglyceride backbone along with thermal stability analyses of New Zealand's commercial fish species (hoki and tuna) for the parent oils and their LCPUFA fractions. Other novel sources of these fatty acids will be presented from our Laboratory Research programmes into fish roe fatty acids and mutton bird oil lipid analyses. Instrumental techniques will be highlighted as convenient alternatives for lipid stability studies, melting and crystallisation profiles and  $^{13}\text{C}$ -NMR advantage over pancreatic lipase analysis of positional distribution.

#### **H4-4 Utilisation of agricultural and aquatic wastes in food manufacturing: Industrially feasible R&D**

Dongxiao Sun-Waterhouse (University of Auckland)

With the increasing challenges related to growing and ageing global populations and food supply security, it is important to discover environmentally sustainable food sources and maximize delivery efficiency of natural goodness to consumers in

recognisable food products using industrially feasible manufacturing approaches and technologies. This talk will address new opportunities, wherein specific examples of both agricultural and aquatic wastes as food ingredients will be included. Rather than in-depth coverage of one or two topics, several key viewpoints and strategies for improving the nutritional quality of foods and adding value to raw materials to enhance human well-being and confer environmental benefits, will be shared.

### **11-1 New Zealand's objectives in the China- New Zealand FTA upgrade**

Brad Burgess (MFAT)

The New Zealand China Free Trade Agreement has been a success story, with two way trade tripling to more than \$26 billion since 2008. It has reduced trade barriers and laid the foundations for closer cooperation with China on a range of issues. But a lot has changed in the ten years since the FTA was signed. New opportunities and new issues in the trading relationship have arisen. Trade policy in both countries has broadened to include new issues like e-commerce. The FTA upgrade is a chance to ensure that our landmark agreement reflects the changed realities of the trading relationship and provides the foundation for more success in the future. Brad Burgess, New Zealand's Lead Negotiator for the FTA upgrade, will briefly reflect on the success of the FTA over the past 10 years, before turning to a discussion of New Zealand's objectives in the upgrade process.

### **11-2 Regulatory aspects of exporting primary products to China**

Neil McLeod (MPI)

China is one of the largest economies in the world. It is New Zealand's number one trading partner, including for primary product exports which has an export value of approximately NZD\$11 billion.

This presentation will provide an overview of the regulatory landscape of exporting to China and the role of the Ministry for Primary Industries (MPI) in negotiating market access and providing official assurances for New Zealand exports. It will include an overview of requirements that need to be met to export primary products to China. Additionally, it will highlight the complexity of Chinese regulatory requirements and other non-tariff barriers, which exporters need to navigate and overcome to be able to export, such as border regulations, import licensing, labelling, sampling and testing.

### **11-3 Interesting China!**

Paul Stephens (Alliance)

New Zealand's engagement with China continues to develop & grow at the pace now seen as the normal ie quickly/fast/hurry up!

China's scale, scope, development and change is often jaw dropping. As impressive is its commitment to step up to global practises for good business.

Yes, there are always bad news stories from China and there are business sharks, no more than anywhere else including NZ. China's business people are serious, committed for the long term that is quite literally a commitment for the long term. China is the biggest global market for many industries from many countries which is the case with NZ's frozen lamb & mutton. Yet NZ is under 3% of their total sheepmeat consumption. 3% is margin of error stuff!

This presentation talks about Alliance's journey with sheep meat over the last 20 years, it will touch on a few of the key cornerstones where decisions were made, the importance of having friends and partners, the need to co-operate and collaborate,

the importance of government and why Alliance (NZ's largest exporter of lamb/mutton) agreed to shift all sheepmeat & chilled meat to just one importer for all of China Heilongjiang Grand Farm Group.

It will also talk about the changes we see, how we respond, the need for shared common ground, the universality of all of this across the relationship of good business - and the importance of science in this protein business.

#### **I1-4 Exporting horticulture products to China – a NZ perspective**

Simon Hegarty (Horticultural Export Authority)

Recognising the enormous economic potential from accessing a country with 1.4 billion consumers, exporting food products to China presents a range of challenges. Factor in the perishability of those products and the risk levels start to rise. This presentation will provide an overview of the NZ horticultural exporting experience in China, spanning regulatory, marketing, logistics, and some cultural challenges as well as statistics on the recent development of New Zealand's trade in horticulture products with China.

#### **I2-1 New opportunities for food and beverage manufacturers**

Richard Cuthbert (Tetra Pak)

Industry 4.0 is about smart manufacturing: fully-integrated collaborative systems that respond in real time to meet changing demands and conditions in the factory. It is where automation combines with IT networks and systems – enriched through live and constantly available data and analytics – to drive operations more efficiently and effectively.

Embracing Industry 4.0 can lead to increased productivity, reduced costs and deliver increased profitability for businesses. Internally it also provides the opportunity for continued progression and upskilling, creating new jobs for employees.

By implementing a five-step process, food and beverage manufacturers can more quickly respond to the changing needs of their consumers and make the most of Industry 4.0.

#### **I2-2 Impact of disruptive technologies on food safety testing**

Nico van Loon (Cawthron)

Talking about the impact of disruptive technologies is 'the flavour of the month' – and rightly so as there is an exponential increase in the use of completely new technologies, and the disruptive use of existing technologies in new areas.

However, there are some important barriers preventing disruptive technologies to affect food safety and certification testing at the same speed as in many other fields.

In this presentation some of these barriers will be discussed, with some case studies of successful and failed (so far) implementations.

Finally, a few potential disruptive technologies in this space and the potential impact on food safety and certification testing will be touched on.

#### **I2-3 Industry 4.0 and the opportunities for the Food Industry**

Nathan Stantiall & Paul Hamilton (Callaghan Innovation)

Manufacturing in New Zealand is facing challenges in productivity, finding skilled staff and adopting digital technologies. A new revolution termed "industry 4.0" captures underlying emergent technologies such as Artificial Intelligence, Augmented Reality, The Digital Twin Concept, Additive Manufacturing and the Internet of Things. Could these technologies revolutionise industry, just as steam

power once sparked the industrial revolution? The application of these technologies not only offers a solution to these challenges, but commercial advantages in the workplace and across sectors such as the food industry. The best way to understand the impact of these technologies to industry, is to see examples of them actually being applied which will be covered in session.

### **I3-1 Food for the gut microbiota is food for thought.**

Gerald Tannock (University of Auckland)

The human gut has been likened to a food machine in which the more easily digested parts of the diet are degraded and absorbed in the stomach and small bowel. Yet, human diets ideally contain fruits and vegetables that have indigestible components – plant cell wall materials such as glucans, arabinoxylans, pectins, xyloglucans, and resistant starches. These components provide the fuel that drives a microbial community – the microbiota – that inhabits the human colon. The kinds of foods that we eat can influence the diversity of bacterial types found within the microbiota because the indigestible substances are degraded and fermented by microbes – examples from early life studies will be discussed. Studying the impact of foods on the microbiota shows us that the community is a sharing society in which the microbes share resources and so provide opportunities for a diverse collection of bacterial species to live together and extract energy from our diet that we would otherwise miss out on – food for thought and lively experimentation.

### **I3-2 The gut microbiome: links to insulin sensitivity in preterm children**

Justin O’Sullivan (University of Auckland)

The gut microbiome influences the development of obesity and type 2 diabetes. Preterm children are at increased risk for insulin resistance, obesity, and cardiovascular disease. We correlated the metabolic phenotype with the gut microbiome composition and functional capacity in children born very preterm (<32 weeks of gestation; n=51) and compared it to those born at term (37–41 weeks; n=50). Children in the two groups had similar demographic characteristics, except that children born very preterm were slightly younger. Preterm children were shorter and leaner than those born at term. Importantly, after adjustment for adiposity, children born very preterm had lower insulin sensitivity than term controls. MixOmics results show that children born preterm had different microbial composition, functions, plasma and fecal amino acids and volatiles and selected inflammatory markers. Our results show that preterm children have leaky guts associated with microbial dysbiosis, low-grade inflammation, and the development of insulin resistance.

### **I4-1 Mathematical Modelling of packaging systems to inform packaging design**

Eli Gray-Stuart (Massey University)

Developing mathematical models is great way to obtain a better understanding of different systems and processes. We use modelling as a tool to understand different packaging systems and how they can be improved. This can lead to better efficiencies throughout the supply chain and ultimately deliver a better product to the consumer. This talk gives an overview of some of the packaging projects carried out at Massey University where mathematical modelling has been used to help tackle several industrial problems. This includes heat transfer through corrugated fiber board to show how its thermal performance could be improved. Computational fluid dynamics modelling of forced air cooling to demonstrate that vent hole design can be optimised to ensure faster and uniform cooling of a product. An

investigation showing that box compression strength can be increased by changing the size and placement of the vent and hand holes. The development a methodology that combines these different packaging functionalities in order to design optimum boxes.

#### **I4-2 Active and Intelligent packaging: enhancing and monitoring quality**

Keith Sharrock (Plant & Food Research)

Active & Intelligent Packaging technology includes a broad range of in-pack devices that enhance or monitor product quality. This presentation will review those categories of A&IP products of particular relevance to fresh produce ripeness, quality and safety. Drawing on experience gained from 20 years of active involvement in the field, I will seek to explain why most A&IP inventions have not proven to be commercially sustainable. However the future is brighter. A&IP is currently a rapidly expanding field, partly driven by increasing demand for reliable on-line marketing of fresh produce and facilitated by recent developments in nanotechnology, printable electronics, RFID, NFC and the ubiquitous Internet of Things, leading to new better targeted and more cost-effective product.

#### **I4-3 Enhancing the performance of food packaging using nano materials**

Geoffrey Waterhouse (University of Auckland)

Blending linear low-density polyethylene (LLDPE) with inorganic fillers such as French chalk, metal oxides or clays is a commonly used approach for modifying the structural and physical properties of LLDPE films for agricultural applications and food packaging. However, poor compatibility of the inorganic filler with LLDPE matrix can lead to a non-uniform filler distribution and thus optical and structural irregularities in the films, significantly reducing the performance and aesthetics of the composite films. This talk will introduce some recent research aimed at the development of novel low cost inorganic fillers that can significantly enhance the properties and performance of LLDPE-based nanocomposite films for agricultural and food applications.

#### **I4-4 Biodegradable plastics and international test methods**

Lou Sherman (SCION)

Globally there is a spotlight on packaging sustainability. Recently UK companies have established a pact which has the target to ensure all packaging is recyclable, reusable or compostable by 2025. The Australian federal government has also announced something similar.

In food applications compostable materials make a lot of sense in terms of being able to more efficiently manage food waste, but there is a need to ensure the materials chosen are fit for purpose. There are already many different sorts of biodegradable plastics but there is some confusion around how these are different to other types of plastics. Although some materials might degrade they are actually causing microplastics which is creating havoc in our water ways and oceans. It is important that those responsible for defining packaging specifications are aware of these differences and that they choose materials which are most suited for the application and the end of life. International standards have been developed to test the degradation of materials in different environments and some of these are associated with logos. This presentation will include an overview of international packaging sustainability drivers, technical information about biodegradable polymers and information on international standards used to test how these materials degrade in the environment.

## DAY 3 Thursday 5 July

### **J1-1 The Digital Supply Chain: Using APIs (Application Programming Interfaces) to provide Integrated Supply Chain Management**

Dan Waugh (Combita)

Taxi companies without taxi's, accommodation companies without accommodation; some of this decade's most disruptive companies are using APIs to provide a unique and differentiated customer experience. APIs are the new digital language, and should form the basis of any digital strategy. They allow companies to easily partner to provide a holistic ecosystem while providing consumers with transparency and traceability.

How can the food industry use APIs to emulate the success of Uber and Airbnb? Find out what an API driven world looks like in the context of an integrated supply chain.

### **J1-2 Are you making high quality products?**

Keryn McKenzie (TWG)

Creating products that customers think are high quality is more complex than just creating a great tasting product. This presentation will explore the building blocks you need to create a high quality product that customers will buy time and time again.

### **J1-3 How to manage our good reputation for food quality (growing, maintaining, defending, recovering) and realistic expectations**

Damien Mather (University of Otago)

A summary of 15 years of the author's primary research conclusions about the influence of production technologies on country image, and then onto trust, legitimacy, price, preference and consumer choice, the disconnect between stated societal GM food attitudes and revealed choice, revealed pricing differentials amongst organic, ordinary (IPM) and GM fruits and fish, food importer country-of-origin selection criteria, boosting market diffusion of food innovations, producer scapegoating, repairing trust, the role of food sector legitimacy and strategies for prevention and recovery of trust and legitimacy, including realistic expectations for growth and loss of international market brand equity and strategies for insuring against sector economic damage.

### **J1-4 Digital revolution: engaging with consumers to build confidence and trust**

Ting Lu (UCD)

Communication is a two-way process, yet the food safety professionals regularly label one-way dissemination of information as communication. However, there is a communication revolution-taking place with an explosion in the use of digital media by citizens in most countries and the opportunity now exists to truly engage and have a dialogue with consumers. It is now possible to easily segment the population and accurately customize interactions with specific elements of the public. The use of more innovative communication approaches, targeting mobile device users, is being used by many corporations and businesses to keep pace with the engine that is driving consumer expectations, attitudes and behavior and the food safety professionals should also embrace this technological opportunity.

In the EU China Safe Project, we are exploring how engagement with consumers should take place in this modern era and this presentation will give an update on progress to date.

### **J2-1 Using microwaves to improve quality of thermally processed packaged foods**

Abby Thompson (FoodHQ)

There is increasing consumer demand for minimally processed premium food products with clean labels. Recent developments using microwaves in a pressurised environment to thermally process packaged foods have the potential to be a step-change for the NZ food industry. This could enable premium semi- or fully-processed food products to be made in NZ with sufficient shelf-life to open completely new export opportunities, improve existing products so that they can capture increased market share or defend existing positions against new competitors.

FIET has funded a project investigating the application of this technology to a range of food products, with a focus on developing the regulatory pathway required for its commercial use. This presentation will provide an introduction to the technology and an overview of the planned experimental work.

### **J2-2 The integration of high pressure based technologies to exploit the endogenous potential of fruit raw materials to obtain a high quality apple based juice.**

Marc Hendrickx, University of Otago Harraways 1867 Visiting Professorship recipient

In recent years, food industry has shown a high interest in clean label foods, which are produced with more organic, natural, and transparent formulations and the use of less invasive processing technologies. This work aimed at combining clean label approaches and high pressure processing to create a fresh and natural cloudy fruit juice and to stabilize its quality characteristics during refrigerated storage. Since multi-response and complex (bio)chemical reactions and physical changes are responsible for quality deterioration, an integrated targeted and untargeted multivariate approach was developed and used as a central research strategy to identify and study quality changes during processing and storage. Cloudy apple juice, sensitive to quality defects such as browning, cloud losses and loss of authentic specific flavours, was selected as a case study. To achieve the objective, the experimental part was divided into two parts: (1) comparing HPP and conventional thermal processing (TP) on maintaining fresh-like quality characteristics of fruit based products and (2) evaluating the potential of a combination of a natural ingredient (kiwifruit puree) and a structure enabling technology (high pressure homogenization, HPH) to control quality losses of high pressure pasteurized cloudy apple juice during refrigerated storage.

### **J2-3 Commercial use of HPP in minimal processing**

Kris Tong (FoodBowl)

The minimal processing of foods has never been more relevant than it is today, with consumers who desire clean label products, seek health and wellness from their foods, and want transparency of the processes and technologies used to manufacture their goods. High Pressure Processing has undergone significant commercialisation over the last decade, and proved itself as a valuable minimal

processing tool across the food and beverage industry, particularly in the areas of food safety and retention of fresh-like qualities.

This discussion aims to outline the commercial benefits, industry examples and future potential for development of products using high pressure processing by illustrating areas of food safety, improved quality, and other manufacturing factors that assist in the feasibility of the technology.

#### **J2-4 Sous vide - from kitchen to processing plant**

Michael Parker (Massey University)

*Sous vide* processing is a cooking method in which a raw or undercooked food is vacuum packaged and heated by precisely controlled cooking, followed by immediate cooling for storage after which it is reheated again before served. *Sous vide* cooking processes are characterised by low temperatures and long times compared with roasting, frying or boiling and was first pioneered in the 1970s by French chefs in exclusive restaurants create tastier, tenderer product. Food Scientists have been involved in the more specific details of the process since the 1990s and home *sous vide* cookers have allowed the general public to cook using this method since the turn of the century.

In moving from the restaurant world to the public world *sous vide* has caught the eye of industry. What are the challenges in scaling *sous vide* from a kitchen to an industrial food processing plant? How can we overcome these challenges?

#### **J3-1 Accelerated evolution: a step-change in food fermentation**

Li Day (AgResearch)

With globalisation and growing consumer desire for authentic and convenient food products, fermented foods offer flavour appeal and cultural connection, and this underlies their expanding popularity in the 'natural' food space. In the newly funded MBIE programme, we will chose microbial cultures responsible for fermentation and accelerate their evolution, searching for phenotypes that have improved characteristics such as flavours and textures. We also aim to predict how people will experience and enjoy new fermented food by mathematically modelling the tastant compounds and textures of model foods, based on molecular profiling and responses of human taste receptors in cell culture in addition to consumer acceptance testing. This will then be correlated with sensory evaluation to identify unique flavour and textural signatures in new fermented foods. The goal is to develop a new generation of science and technologies to support the NZ food industry across multiple sectors (dairy, meat and seafood) to grow export of niche, high value fermented foods.

#### **J3-2 The revitalization of Maori kai as an art-form**

Tanya Poipoi-Davy (Kiwi Kai Cuisine Ltd)

Mothers' stories, recipes, journals and whakapapa (family history) preserve and convey unique and rare blends of Maori kai traditions to descendants. Records indicate that kai mara (preservation practiced by Maori prior to European arrival), endemic shrubs and herbs were used to prepare food when abundant and in season or preserved when kai was scarce. Eels, fish and shellfish were hung to dry in the heat of the sun on stones or poles then pound into straps. Kumara (sweet potato) was washed in sea-water then placed on Manuka-thatched roofs of whare (houses), and after several weeks the tubers would be dried. Kanga (corn) was placed in flax baskets and left in running streams to rot (over-ferment). Titi (mutton birds) and kereru (wood pigeon) would be rolled in fat then hung in the shade of the trees until

they were eaten. Koura (cray) and kina (sea-urchin) roe were buried in the earth and covered by manuka branches for 2-3 months. A strong sense of community and kinship ensured food was collected, preserved and shared between families. When Europeans arrived in New Zealand bringing gardening, livestock, poultry and cooking and refrigeration, a staple food called rewena emerged around the 1840s. Rewena sour-bread is made by using fermented riwai (potato) starter culture. The more traditional preserved foods disappeared. Nevertheless, fermented food is trending and modern science is advancing into a resurgence of Maori kai art forms and the revitalisation of a national taonga (heritage).

### **J3-3 Microbial safety of traditionally fermented foods in East and South Asia**

Tony Mutukumira (Massey University)

Traditionally fermented food and beverages of East and South Asia play a dominant role in the cultural heritage of the region. For centuries, Asians have been practicing traditional food fermentations generating a wide diversity of products with unique attributes. Typical indigenous fermented products in the region include cereals and legumes, fruits and vegetables, milk, meat, fish and sea-foods, condiments and beverages. These products are renowned for their appealing sensory profiles and are considered nutritious. Their specific recipes and preparation methods are depended on the indigenous knowledge of the native communities which is transmitted through generations with little, if any documentation. Traditional fermentation generally involves the use of an undefined microflora which naturally develops into dominant starter culture through traditional fermentation techniques such as back-slopping. Each fermented food is characterised by a group of distinct microflora and typical examples are the lactic acid bacteria, yeasts and moulds. The mode of action of traditional fermentation ensures the safety of fermented foods through synthesis of antimicrobial compounds, and removal or destruction of harmful substances. At present, there is a surge in the demand for artisan-made traditional fermented foods due to their perceived health benefits. However, majority of the products are still processed as cottage ventures. The absence of robust scientific data on traditional fermentation hinders the prospects for commercial scale up. The paper provides a background to traditional fermented foods in East and South Asia, associated microbial hazards and microbial safety.

### **J3-4 Industrialising traditional foods**

Richard Archer (Massey University)

Many foods have evolved over centuries of artisanal manufacture but become sought-after items in the supermarkets of today's global economy. How does one go about moving from 10 litres of a fermented drink or two wheels of cheese to one hundred tonnes per day? You want to retain the organoleptic properties and craft character but ensure safety and shelf life and still make a buck. There are guiding principles and it can be done logically.

### **J4-1 Composition, structure, and physico-chemical properties of Bovine and Non-Bovine Milks**

Debrashree Roy (Riddet Institute)

Opportunities for non-bovine milk and milk products are increasing worldwide as well as in New Zealand mainly due to increasing consumers interest in healthy or natural or traditional foods.

The aim of this study was to investigate the differences in bovine (cow) and non-bovine (buffalo, goat, sheep and red deer) milks with respect to their general

composition, fat globule and casein micelle size/structure, protein profiles, and gelation properties.

Overall, the study indicated that the same technological conditions of bovine milk may not be applied for other milks as milk from different species varies in their physicochemical and gelation properties. The results obtained can be employed further for a better understanding of curd/yoghurt/cheese-making properties of milk from different species.

Further work is underway to understand the structural changes in casein micelles and fat globules of bovine and non-bovine milks, especially focusing on their curd formation characteristics in human stomach using a human gastric simulator.

#### **J4-2 Milk fat is back: possible consequences for formula-fed infants**

Caroline Thum (AfResearch/Riddet Institute)

Fat provides a large portion (~50%) of the caloric intake of breast and formula-fed infants. In the case of breast milk, beyond being an important energy source, milk fat also contains bioactive components such as phospholipids, cholesterol and specific proteins, known to improve brain development and defence against infections.

Infant formula products however, contain vegetable oils (rapeseed oil, sunflower, palm, and/or coconut oil) as fat sources instead of milk fat components. Advantages of breast milk over infant formula on brain and immune system development may be attributed to differences in fat composition (i.e lipid content and fatty acid profile). In recent years, advances in dairy processing technology have made bovine milk fat components available to use as a supplement in infant formulas.

Substantiation of their health benefits is a promising avenue for developing more effective products to close developmental gaps between breast and formula-fed infants.

#### **J4-3 Stabilisation of *Lactobacillus rhamnosus* against heat related storage stresses**

Sarah Priour (Riddet Institute/MU/Fonterra)

In the past few years, research has established a link between the gut health and the overall health. A healthy microbiome is a major step towards a healthy gut. Probiotics could help by improving the gut microbiome and thus, are being added to a wide range of food products. However, maintaining them in a viable state is still a challenge.

In this study, we looked at how to protect *Lactobacillus rhamnosus* from the dehydration and storage stresses. The initial work focused on optimizing the protectant uptake for the bacteria, followed by the study of probiotic viability after freeze drying and storage at 30°C. The protectants were selected based on the current literature. Following the initial storage, we selected the best combinations of protectants using a mixture design of experiment. Results for *Lactobacillus rhamnosus* showed only 0.5 log CFU/g reduction over 8 months at 30°C, with a death rate of 0.05 per month.

#### **J4-4 Hydrogen production and consumption by human gut microbes**

Nick Smith (AgResearch/Riddet Institute)

Hydrogen is a widely produced metabolite by gut bacteria during carbohydrate fermentation. Some members of the gut microbiota such as methanogens, sulphate-reducing bacteria and acetogenic bacteria can cross-feed on hydrogen for energy generation while synthesizing methane, hydrogen sulphide and acetate, respectively, in the process. All three microbial groups can coexist in the human gut

and a range of factors affect the relative ratios of these groups, including diet. Increasing evidence links higher concentrations of hydrogen sulphide and methane to poor gut function. Therefore, we require a dietary means by which to control the abundance of methanogens and sulphate-reducing bacteria while increasing the more beneficial acetogenic bacteria. Using mathematical modelling and existing data, we aim to predict the effect of certain foods and their components on the hydrogen-consuming microbes to design foods with beneficial effects on gut health.

### **K1-1 How technology is changing global consumer behaviour in food and beyond.**

Tim Foulds (Euromonitor)

In his presentation, Tim Foulds, Head of Research at Euromonitor, will explore how the shopper journey is changing within the mobile world, and what manufacturers and retailers need to know to address these consumer shifts. The simple split of offline and online purchasing no longer fits the modern consumer and requires players to adapt to trends such as subscription models, new retail formats, continuing the brand story beyond the actual purchase, and the importance of personalisation. Tim will also look at the how technology will continue to shape the consumer in the future, and how players need to respond.

### **K1-2 25 years of research on emerging technologies for the food industry: progress made, lessons learned, future challenges and opportunities**

Marc Hendrickx, University of Otago Harraways 1867 Visiting Professorship recipient

For more than two decades now, extensive research has been conducted on the effect of a number of 'novel technologies' on food safety and quality aspects. An important part of the research has been focused on pressure based technologies (both the use of high hydrostatic pressure and high pressure homogenization) and pulsed electric field treatments. In the same period, these technologies have found their way towards industrial applications, in particular high pressure processing. This presentation will review the progress that has been made over the past 25 years both in terms of research as well as industrial applications. The review will discuss aspects of equipment development (research tools and industrial manufacturing) as well as the impact of the processes on food quality characteristics including effects on a.o. enzyme inactivation and activity, structural and textural aspects, colour aspects, flavour aspects and (micro) nutrient retention and bio-accessibility. The presentation will include examples in the field of plant based food systems.